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ABSTRACT

Designed to improve students' thinking, learning, and creative skills while they learn to program a microcomputer in BASIC programing language, this instructional manual for intermediate learners provides a brief section of information for each new topic together with a sample program to enter, run on the computer, and observe; a suggested change to clarify the principle being taught, and a challenge requiring use of the new principles. Each chapter includes a review. This volume specifically explains how to program the computer to make decisions--to follow one set of commands in one case and another set in a different case--using IF-THEN, IF-GOTO, IF-THEN PRINT, IF-THEN END, and INT(X). The following additional commands are then explained: PR#1, PR#0; FRE(0), and CHR$(X). A discussion of editing with the Apple II microcomputer covers use of the cursor movement mode, editing, and deleting. The use of the command RND(1) to randomly select a word or number is also described. A reference chart displays commands and their functions. Separate color coded project books for elementary, junior high, and high school/adult students are available for this manual. (Author/LMM)

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TLC

APPLE II®

for Growing Minds

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THINKING · LEARNING · CREATING

TLC

APPLE II®

for Growing Minds

Volume 3

by Kathy Taitt

ation Resources

CREATIVE LEARNING ASSOCIATION, INC.
RR#4, Box 330
Charleston, Illinois 61920

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Table of Contents

CHAPTER 1: MAKING DECISIONS

Page

IF-THEN 1

IF-GOTO 3

IF-THEN PRINT 4

IF-THEN END 6

INT(X). 10

Review. 14

CHAPTER 2: SOME EXTRA COMMANDS: PR#1, PR#Ø, FRE(Ø), CHR$(X).

PR#1 15

PR#Ø 16

FRE(Ø). 18

CHR$(X) 20

Review 26

CHAPTER 3: EDITING WITH THE APPLE

CURSOR MOVEMENT MODE 27

Editing 28

Deleting. 31

Review. 35

CHAPTER 4: RANDOM CAN ADD THE UNEXPECTED

RND(1). 36

Review. 49

Reference 50

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CHAPTER 1: MAKING DECISIONS

INFORMATION

In many programs you would like the computer to make a decision, to follow one set of commands in one case and another set in a different case. This can be done by using the IF-THEN command. IF a certain condition is true, THEN the computer will perform a certain operation. IF the condition is not true, THEN the computer will ignore the operation and go on to the next program line.

ENTER/RUN/OBSERVE

```
10 HOME
20 A=7
30 IF A=7 THEN GOTO 100
40 END
100 PRINT "A WAS 7!"
```

CHANGE IT/RUN/OBSERVE

Now change line 20 so you can INPUT a number.

```
20 INPUT "GUESS A NUMBER!";A
```

CHANGE IT/RUN/OBSERVE

Add this:

```
40 PRINT A;" WAS NOT MY NUMBER."
50 END
```

CHALLENGE

In line 30 change the number to be represented by A. Also change the messages in lines 20, 40 and 100.

ENTER/RUN/OBSERVE

```
10 HOME
20 PRINT "GUESS MY NUMBER.  (BETWEEN 1 and 10)"
30 INPUT N
40 IF N=5 THEN GOTO 100
50 PRINT "WRONG, GUESS AGAIN!"
60 GOTO 30
100 PRINT "CONGRATULATIONS!!  YOU GOT IT!"
110 END
```

Run this program several times, INPUTing different numbers. Then LIST again to see how the program works.

CHANGE IT/RUN/OBSERVE

```
40 IF N=5 GCTO 100
```

When you use the GOTO command in an IF-THEN statement, you can leave out the word THEN.

CHANGE IT/RUN/OBSERVE

```
40 IF N=7 GOTO 100
```

CHALLENGE

CREATE a program to guess your age. When your program works, get a friend to try it.

INFORMATION

IF-THEN can also be used with PRINT.

ENTER/RUN/OBSERVE

```
10 HOME
20 PRINT "WHAT IS YOUR LAST NAME?"
30 INPUT N$
40 PRINT "ARE YOU A FEMALE?  (YES/NO)"
50 INPUT S$
60 PRINT "HELLO ";
70 IF S$="YES" THEN PRINT "MS. ";
80 PRINT N$;" !"
90 END
```

LIST after you RUN this program. Notice why YES gives a different reply from NO?

CHANGE IT/RUN/ OBSERVE

```
55 HOME
```

CHANGE IT/RUN/OBSERVE

Now add these lines to your program:

```
60
70 IF S$="YES" GOTO 100
80 PRINT "PLEASED TO MEET YOU MR. ";N$
```

(program continued)

```
100 PRINT "IS IT MRS. OR MISS?"
110 INPUT G$
120 HOME
130 IF G$="MRS." GOTO 200
135 IF G$="MRS" GOTO 200
140 PRINT "DO YOU PREFER TO BE CALLED MISS ";N$
150 PRINT "OR MS. ";N$;"?"
160 INPUT G$
170 PRINT:PRINT "IT HAS BEEN NICE TALKING WITH"
180 PRINT "YOU ";G$;" ";N$
190 END
200 PRINT "HAVE A NICE DAY MRS. ";N$;".":END
```

RUN this program several times trying different responses.

CHALLENGE

Write a program that will ask the following question: Who is the most important person in this room?

You will need to provide the answers that you will accept to this question and the messages you wish printed when other responses are given.

ANOTHER CHALLENGE

Create a 5-question quiz. Use IF-THEN to give responses for acceptable and unacceptable answers.

INFORMATION

So far you have used PRINT and GOTO with IF-THEN.

You can also use END.

ENTER/RUN/OBSERVE

```
10 HOME
20 PRINT "NOTE:  IF YOU WANT TO STOP, AND
YOU'VE"
30 PRINT "ENTERED LESS THAN 11 NAMES, ENTER
XXX."
40 PRINT:PRINT
50 REM *** THIS STORES THE NAME IN AN ARRAY
***
60 INPUT "WHAT IS THE NAME? ";N$(X)
70 REM *** THIS CHECKS FOR THE XXX END CODE
***
80 IF N$(X)="XXX" THEN END
90 REM *** THIS STORES THE PHONE NUMBER ***
100 INPUT "WHAT IS THE PHONE NUMBER? ";P$(X)
110 REM *** THIS IS A COUNTER ***
120 X=X+1
130 IF X=11 THEN PRINT "YOU JUST USED YOUR
LAST ARRAY SPACE.":END
140 GOTO 50
```

CHANGE IT/RUN/OBSERVE

This will print out the contents of the array.

```
 8Ø IF N$(X)="XXX" GOTO 2ØØ
2ØØ FOR T=Ø TO X-1
21Ø PRINT N$(T),P$(T)
22Ø NEXT T
```

(You may also wish to change line 13Ø)

Save this program for the next challenge.

CHALLENGE

Add to the above program, so that after line 22Ø, the program asks you to INPUT one of the phone numbers, and it will display the name that goes with it.

INFORMATION

So far in your IF-THEN statements, the computer has been checking to see if a variable equals a particular value.

The computer can also check to see if the variable is more or less than the given value. The symbols for these relations are:

> is more than

< is less than

<> is not equal to

ENTER/RUN/OBSERVE

```
10 HOME:PRINT
20 PRINT "GUESS THE NUMBER I'M THINKING OF!"
30 PRINT
40 INPUT N:PRINT
50 IF N<7 THEN PRINT "YOUR GUESS IS TOO LOW."
60 IF N>7 THEN PRINT "YOUR GUESS IS TOO HIGH."
70 PRINT
80 IF N=7 THEN PRINT "CONGRATULATIONS!! YOU
GOT IT!"
90 IF N=7 THEN END
100 GOTO 20
```

When you run the program on the last page, try inputting numbers other than 7.

CHANGE IT/RUN/OBSERVE

```
*********************************************
*                                           *
* 75 IF N<>7 THEN PRINT "TRY ANOTHER GUESS."*
*                                           *
*1ØØ GOTO 4Ø                                *
*                                           *
*********************************************
```

CHALLENGE

Change the program so it can be used to guess your weight. Improve the instructions by giving bounds on the number you guess.

INFORMATION

In the examples so far, the numbers ycu have used have all been whole numbers (integers). But in real life, you encounter many numbers that are not integers, such as fractional and decimal numbers. Mathematical operations often yield decimal numbers as answers.

There is a very useful command in BASIC that will turn a non-integer into an integer. The following programs should help to illustrate the usefulness of this new command, INT(X).

ENTER/RUN/OBSERVE

```
10 HOME
20 N=12
30 PRINT N,N/7
```

CHANGE IT/RUN/OBSERVE

```
40 PRINT N,INT(N/7)
```

INFORMATION

The command INT(X) will give you the part to the left of the decimal point, ignoring the part to the right of the decimal if any exists. INT(X) does not round a number to the nearest integer, INT(4.99999) = 4. The expression in the parenthesis of the INT command can be a number (5.6, N, etc.) or an operation (5.6/3, 3+X, T*I-1, etc.).

ENTER/RUN/OBSERVE

```
10 N=1/2
20 PRINT N, INT(N)
```

CHANGE IT/RUN/OBSERVE

```
 5 HOME
10 FOR X=0 TO 20
15 N=X/2
30 NEXT X
```

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CHANGE IT/RUN/OBSERVE

```
**********************************************
*                                            *
* 10 FOR X=-10 TO 10                         *
*                                            *
**********************************************
```

Notice how the negative X-values become even smaller numbers after INT. INT(X) reduces each number to the next lowest integer.

CHALLENGE

Suppose you own a construction company and it takes you and your workers 1.25 months to build a house.

Write a program that will calculate the number of complete houses that have been built by a) March; b) July; c) October; and d) December; assuming you start work on January 1st.

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ENTER/RUN/OBSERVE

```
10 HOME
20 FOR N=1 TO 15
30 PRINT N,
40 IF N/2=INT(N/2) THEN PRINT "THIS NUMBER IS
EVEN"
50 IF N/2<>INT(N/2) THEN PRINT "THIS NUMBER
IS ODD"
60 NEXT N
```

CHANGE IT/RUN/OBSERVE

```
55 IF N/5=INT(N/5) THEN PRINT N;" IS A MULTIPLE
OF 5"
```

CHALLENGE

Write a program that will print the multiples of 9 from 0 to 99 using INT(X) and IF-THEN.

REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	Requires the computer to make a decision. It does one thing if the condition is true, and something else if it is not.
	Turns real numbers into integers by ignoring all numerals to the right of the decimal point.

CHAPTER 2: SOME EXTRA COMMANDS: PR#1, PR#Ø, FRE(Ø), CHR$(X).

INFORMATION

If you have a printer connected to your computer, you can direct the computer to print cut information at the printer.

ENTER/RUN/OBSERVE

```
10 HOME
20 PRINT " GREAT SPIRITS HAVE ALWAYS
ENCOUNTERED"
30 PRINT "          VIOLENT OPPOSITION:
40 PRINT "           FROM MEDIOCRE MINDS"
50 PRINT
60 PRINT "                          BY ALBERT
EINSTEIN"
```

CHANGE IT/RUN/OBSERVE

In order to get a LISTing at the printer, try this:

```
PR#1
LIST
```

press RETURN

press RETURN

To turn the printer off, type:

```
PR#Ø
```

and press RETURN.

CHANGE IT/RUN/OBSERVE

You can also make these commands part of the program.

```
  5 PR#1
 7Ø PR#Ø
```

RUN, watch the printer come on, print the message, and turn off.

CHANGE IT/RUN/OBSERVE

Type NEW and try this one.

```
 1Ø HOME
 2Ø INPUT " PLEASE TYPE IN YOUR NAME.";N$
 3Ø INPUT " NOW TYPE YOUR STREET ADDRESS.";A$
 4Ø INPUT " YOUR CITY.";C$
 45 INPUT " YOUR STATE.";S$
 5Ø INPUT " YOUR ZIP CODE.";Z$
 55 PR#1
 6Ø PRINT N$
```

(program continued)

```
 70 PRINT A$
 80 PRINT C$;",";S$;"   ";Z$
 90 PRINT:PRINT:PRINT
100 PR#0
```

You could use a program such as this to create mailing labels.

CHALLENGE

Create a program that uses PR#1 and PR#Ø. The program should allow five people's names and phone numbers to be INPUTed. The printer should then print out a list.

INFORMATION

It is possible to find out the amount of unused memory remaining in the computer by using the FRE(Ø) command. This can be very handy to know, especially when ycu're writing long programs and you want to know how much memory you have left to work with.

ENTER/RUN/OBSERVE

```
PRINT FRE(Ø)
```

This gives a number that is related to the unused memory. If you have more than 32767 bytes of memory available, the computer will return a negative number. Just add 65536 to the number to get the amount of free memory left.

CHANGE IT/RUN/OBSERVE

```
PRINT 65536+FRE(Ø)
```

CHANGE IT/RUN/OBSERVE

Type NEW. Now enter:

```
**********************************************
* PRINT 65536+FRE(Ø)                         *
**********************************************
```

Record the number you get when there is no program in the memory. Call this number A.

Now enter a short program into your computer.

RUN the program.

Again, enter:

```
**********************************************
* PRINT 65536+FRE(Ø)                         *
**********************************************
```

Call this number B. How does B compare with A?

CHALLENGE

Create a program that allows you to INPUT ten numbers. Have the program display the number on the screen if it is a multiple of three. Let the last number that it displays be the amount of memory used.

INFORMATION

The computer uses numbers to represent the letters and characters it displays on the screen. It also uses numbers to represent actions, such as ringing the bell, returning to the left of the screen, and clearing the screen.

By providing the right number, you can produce the desired result.

ENTER/RUN/OBSERVE

First, to see a star, try this:

```
10 PRINT CHR$(170);
```

CHANGE IT/RUN/OBSERVE

Now add these lines:

```
 5 FOR T=1 TO 40
15 NEXT T
```

CHANGE IT/RUN/OBSERVE

Make these changes:

```
  3 INPUT X
 1Ø PRINT CHR$(X);
```

Now you can select a number and see what a whole line of the corresponding symbol looks like.

Try the following values:

95
7
99
255 (This is the cursor symbol if you have a model IIe.)

CHALLENGE

Change the above program to display all of the possible values of X for CHR$(X). How can you find what the largest value of X can be?

INFORMATION

By placing the last program in a FOR-NEXT loop, you can see all the symbols from Ø to 255.

ENTER/RUN/OBSERVE

To see this list of all the CHR$ numbers and their corresponding symbols, enter:

```
10 HOME
20 FOR X=0 TO 255
30 PRINT X,CHR$(X)
40 FOR T=1 TO 50:NEXT T
50 NEXT X
```

This is often faster than using a reference manual.

CHANGE IT/RUN/OBSERVE

Add these lines:

```
15 INVERSE
60 NORMAL
```

Notice what 32 gives in the INVERSE mode.

CHALLENGE

Using CHR$(32), draw a horizontal line across the screen. If you have a model IIe, also try CHR$(95). Can you use this to create a chart, graph or framed display?

INFORMATION

CHR$(32) can be used to produce charts and graphs more easily than the PRINT statement.

ENTER/RUN/OBSERVE

```
10 HOME
20 FOR X=1 TO 40
30 INVERSE
40 PRINT CHR$(32);
50 NEXT X
70 PRINT
90 FOR X=1 TO 40
100 PRINT CHR$(32);
110 NEXT X
120 NORMAL
```

CHANGE IT/RUN/OBSERVE

```
100 PRINT CHR$(95);
```

CHANGE IT/RUN/OBSERVE

```
65 INVERSE
66 PRINT CHR$(32);
67 NORMAL
7Ø PRINT "          KATHY TAITT          ";
72 INVERSE
73 PRINT CHR$(32)
74 NORMAL
```

CHALLENGE

Create a program that displays your name inside an attractive design. Use plenty of CHR$ numbers!

REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	Turns the printer on.
	Turns the printer off.
	Tells how much usable memory is left in the computer.
	Prints characters on the screen, clears the screen, beeps, and performs many other actions, depending upon the number you use with it.

CHAPTER 3: EDITING WITH THE APPLE

INFORMATION

One way to correct an error in a program line is to retype the entire line. You will now learn another way to edit (change) a line.

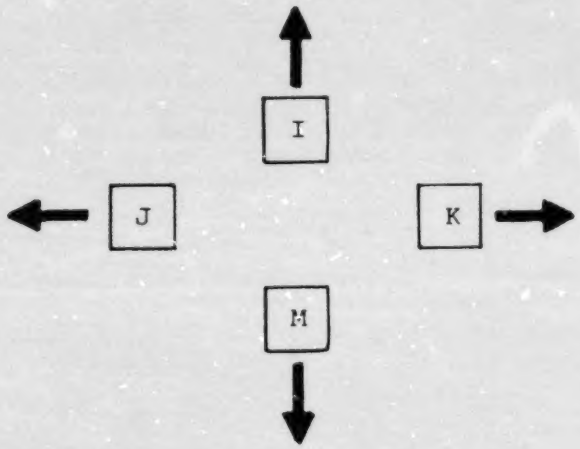
ENTER/RUN/OBSERVE

```
10 N=5
20 PRINT N;"   ":N+1"   ";N+2
```

When you try to RUN this program, the computer will give you an error message. The colon in line 20 needs to be replaced with a semicolon.

CHANGE IT/RUN/OBSERVE

To make the change, first LIST line 20. Then press the [ESC] key. This puts the computer in the CURSOR MOVEMENT MODE. Press the [I] key and the cursor moves upwards. Press the [J] key and it moves to the left. Use the [I] and [J] keys to get the cursor positioned on top of the 2 in 20. Now press the [SPACE BAR] to get out of the CURSOR MOVEMENT MODE. Press the right



arrow [→] key (NOT K!) until the cursor is on top of the colon (:). This will copy all of line 2Ø up to the point where the colon is. Now type the semicolon (;) and then copy the rest of the line by using the right arrow key. When you reach the end of the line, press [RETURN] to record the change.

List line 2Ø to be sure the change has been made. If at any time during the editing process you should press a key you did not wish to press, AND you haven't hit [RETURN] yet, you can abort the mission by pressing [CTRL] [X]. This tells the computer to ignore anything you did and to keep the line the way it was. But

remember, CTRL X only works if RETURN hasn't been pressed yet. Practice making changes in this program until you are good at editing changes.

CHALLENGE

Now change line 1Ø so that N=6. Even though it would be faster just to retype the line, practice using the new method. LIST line 1Ø to be sure the correction has been made.

CHANGE IT/RUN/OBSERVE

Add these lines to your program:

```
30 FOR N=1 TO 10
40 PRINT "THE VALUE OF N IS ";N;"."
50 NEXT N
```

If you decide to change line 3Ø to line 15 so that it will come before line 2Ø, you can do it! LIST line 3Ø and then press the ESC key. (Remember that this puts the computer in the CURSOR MOVEMENT MODE.) Move the cursor with the I and J keys so it is on top of the 3 in 3Ø. (The K key moves the cursor to the right and the M key moves the cursor down.) Now press

the [SPACE BAR] to get out of the CURSOR MOVEMENT MODE. Type 15 and then copy the rest of the line by using the right arrow key. Press [RETURN] when you reach the end of the line.

LIST your program. Notice that line 15 is there, but so is line 3Ø. To get rid of line 3Ø, just type 3Ø and press [RETURN]. Now LIST. Line 3Ø should be gone and line 15 should be there with the information that was in line 3Ø.

CHALLENGE

Switch the order of lines 2Ø and 4Ø in your program by the method described above. It would probably be helpful to give them different numbers during the editing process; such as 25 for line 4Ø and 3Ø for line 2Ø.

INFORMATION

You have learned to change information in a line by replacing it. What if information must be deleted? No problem! Just switch into the CURSOR MOVEMENT MODE and pass over the part you wish to delete using the [K] key. When you use the [K] key instead of the right arrow, the characters won't be copied.

CHANGE IT/RUN/OBSERVE

This exercise will help you to understand deleting. Add these lines to your program:

```
60 PRINT:PRINT:PRINT
70 PRINT N,N+1;"   "N+2"        ";N+3
```

Suppose you decide there are too many spaces between N+2 and N+3. To delete some of these spaces, first follow the usual editing steps:

1. LIST line 70.
2. Press the [ESC] key.
3. Move the cursor so it's on the 7 in 70.
4. Press the [SPACE BAR].

5. Copy the line with the right arrow key [→] to the point you want to delete.
6. Press the [ESC] key (you are now in CURSOR MOVEMENT MODE again).
7. Press the [K] key to move the cursor over the spaces you want to delete.
8. Press the SPACE BAR to get out of the CURSOR MOVEMENT MODE.
9. Use the right arrow key to copy the rest of the line.
10. Press [RETURN] to enter the new line in the computer.

If you get tired of pressing the right arrow key so much, you can hold down the [REPT] key while pressing the right arrow key. On the APPLE IIe this is not necessary, as the keys are self-repeating if you hold them down.

CHALLENGE

Now let's turn back to the problem created by the last challenge.

First erase lines 60 and 70 from your current program. You should now be left with the program

you had at the end of the last challenge. Using the editing techniques just discussed, delete the last semicolon from line 25, (the old line 4Ø). This should cause the program to look more attractive when it is RUN.

ENTER/RUN/OBSERVE

To practice what you have learned, enter the following program into your computer and make the changes that are asked for below.

```
1Ø HOME
2Ø PRINT "THIS IS JUST A PRACTICE EXERCISETICE."
3Ø FOR X=1 TO 2Ø
4Ø PRINT X,B+1,X+2
5Ø FOR T=1 TO 1ØØ:NEXT T
6Ø NEXT X
```

CHALLENGE

Make the following changes:

1. Change the 2Ø in line 3Ø to 25.
2. Change the B in line 4Ø to X.
3. In line 5Ø, change 1ØØ to 5Ø.
4. Remove TICE from line 2Ø. Be careful not to copy unwanted spaces!

INFORMATION

Here's a summary of what you have learned about editing on your APPLE computer.

1. The first thing you must do is put the computer in the CURSOR MOVEMENT MODE ([ESC] key) and then move the cursor until it is on the left-most numeral of the program line number.

2. Get out of the CURSOR MOVEMENT MODE by pressing the [SPACE BAR].

3. Move to the point on the line that you want to change by the right arrow key [→]. When you move the cursor using the arrow key, the computer assumes you want to keep everything the cursor passes over.

4. When you come to a character in the line that you want to change, simply type the new character over the old one. Move to the end of the line using the right arrow key.

   When the program line is the way you want it, enter the new line into the computer by pressing [RETURN].

5. If you want to completely delete a character, move to the spot using the arrow key, get back into the CURSOR MOVEMENT MODE by using the [ESC] key, then move over the undesired characters using the [K] key. Get out of CURSOR MOVEMENT MODE by pressing the [SPACE BAR] and then use the arrow key to go to the end of the line. Finally, press [RETURN].

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REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	This key puts the computer in the CURSOR MOVEMENT MODE.
	When the computer is in the CURSOR MOVEMENT MODE, these four keys will move the cursor in the direction indicated: up, down, right, left.
	Used to move the cursor to the right when the computer is not in the CURSOR MOVEMENT MODE.
	Pressing this will get you out of the CURSOR MOVEMENT MODE.
	If you want to get out of the editing process with your line the way it was originally, these keys will do it, if you haven't pressed RETURN yet.
	Holding this key down while pressing another will cause the character to be repeated. On the APPLE IIe most keys are self-repeating.

CHAPTER 4: RANDOM CAN ADD THE UNEXPECTED

INFORMATION

The computer can be used to randomly select a number or word. The command that does this is RND(1).

ENTER/RUN/OBSERVE

```
10 PRINT RND(1)
```

RUN this several times and note the number that is displayed.

CHANGE IT/RUN/OBSERVE

```
 5 FOR T=1 TO 10
15 NEXT T
```

Run the program several times and notice that each time you do, the numbers that you get are different.

CHANGE IT/RUN/OBSERVE

```
10 N=RND(1)
13 PRINT N,10*N
```

You now know how to generate random numbers between Ø and 1Ø.

CHALLENGE

Create a program that will print ten random numbers that fall between Ø and 1ØØ.

Edit the program so the ten numbers are all between Ø and 32.

Can you figure a way to get them between 16 and 48?

INFORMATION

If you wish to get rid of all those numbers to the right of the decimal, you can do so by using the INT(X) command.

ENTER/RUN/OBSERVE

Erase your old program and enter this one:

```
10 HOME
20 FOR T=1 TO 10
30 N=RND(1)
40 PRINT 10*N, INT(10*N)
50 NEXT T
```

Notice that in the second column, the decimal part of the number is eliminated, leaving an integer smaller than the original number.

CHANGE IT/RUN/OBSERVE

To create the effect of rolling a six-sided die five times, add these lines:

```
20 FOR T=1 TO 5
40 PRINT T,INT(7*N)
```

Why was N multiplied by 7? RND(1) generates a number from Ø to 1, not including 1. 6*RND(1) would generate a number from Ø to 6, not including 6. The highest number that could be picked, 5.999999, would become 5 after the INT command. So to ever get a 6 in your program you can multiply RND(1) by 7. This will generate numbers from Ø to 6 inclusive.

As you can see, however, if you RUN this program several times, you may get a zero--and there aren't any zeros on a normal six-sided die!

To take care of this little problem, try this:

```
**********************************************
* 4Ø PRINT T,INT(6*N)+1                      *
**********************************************
```

This will give an integer between Ø and 5, to which 1 is added, producing an integer between 1 and 6 inclusive.

CHALLENGE

In some games, such as Dungeons and Dragons, many-sided dice are used. Create a program that will represent the roll of an eight-sided die.

Now edit it to produce five rolls of a ten-sided die.

INFORMATION

To randomly select words, you first store the words in an array, and then randomly select array storage locations.

ENTER/RUN/OBSERVE

Enter this into your computer after clearing the memory with NEW.

```
10 HOME
20 REM *** THIS ENTERS 5 NAMES INTO THE ARRAY ***
30 FOR X=1 TO 5
40 INPUT " ENTER A GIRL'S NAME. ";N$(X)
50 NEXT X
```

Don't run this program yet!

These next lines will randomly select a number between one and five and then print the contents of that array location.

```
60 REM *** NOW CREATE A RANDOM NUMBER ***
70 R=RND(1)
80 T=5*R
90 I=INT(T)+1
```

(program continued)

```
110 PRINT I,N$(I)
```

RUN the program.

CHANGE IT/RUN/OBSERVE

Now to make it keep selecting names:

```
120 PRINT:PRINT "IF YOU WISH ANOTHER NAME,
PRESS THE"
130 INPUT "'A' KEY.";B$
140 IF B$="A" GOTO 60
150 PRINT "OKAY, THAT'S ALL FOR NOW."
```

CHANGE IT/RUN/OBSERVE

To make the program match a list of girls with a list of boys, add these lines:

```
 45 INPUT "ENTER A BOY'S NAME.";P$(X)
 95 J=INT(5*RND(1))+1
110 PRINT N$(I),P$(J)
```

Notice that line 95 did for the boys what lines 70, 80, and 90 did for the girls.

CHANGE IT/RUN/OBSERVE

Make the necessary changes in the above program so that the computer will enter seven names into each array, and then randomly match the boys with the girls to form seven pairs.

CHALLENGE

Create a program that will allow you to store the nine words below in three arrays.

ARRAY	A	B	C
	Bill	runs	fast.
	Jane	eats	often.
	Tom	learns	backwards.

Create a program that randomly selects a word from each array to form a sentence. When your program is working, try to increase each array to five words.

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INFORMATION

Many events appear to be random within certain boundaries. Several examples are shown below.

ENTER/RUN/OBSERVE

The rolling of two dice, eight times.

```
10 HOME
20 FOR R=1 TO 8
30 D1=INT(6*RND(1))+1
40 D2=INT(6*RND(1))+1
50 PRINT "ROLL ";R,D1,D2
60 NEXT R
```

If the total value of the roll is also desired, add this:

```
50 PRINT "ROLL ";R;"    ";D1;"    ";D2;
"    ";D1+D2
```

CHALLENGE

Change the program to represent five rolls of three dice. Print the value of each die and the total value of each roll.

ENTER/RUN/OBSERVE

To represent drawing names from a hat, try this one.

```
 1Ø HOME
 2Ø PRINT "ENTER XXXX AS THE LAST NAME."
 3Ø REM *** FIRST PUT THE NAMES INTO THE
HAT ARRAY H$(X) ***
 4Ø X=X+1
 5Ø INPUT " TYPE IN A NAME AND PRESS RETURN."
;H$(X)
 6Ø IF H$(X)="XXXX" GOTO 1ØØ
 7Ø GOTO 4Ø
1ØØ REM *** NOW RANDOMLY DRAW THE NAMES ***
11Ø Y=RND(1)
12Ø Z=(X-1)*RND(1)
13Ø W=INT(Z)+1
14Ø REM *** W IS A RANDOM INTEGER BETWEEN 1
AND X-1 ***
15Ø REM *** ONCE THE NAME IS SELECTED, IT CAN-
NOT STILL BE IN THE HAT...SO IT MUST BE
REMOVED! ***
16Ø IF H$(W)="Ø" GOTO 11Ø
17Ø PRINT H$(W)
18Ø H$(W)="Ø"
19Ø GOTO 11Ø
```

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This program will continue looking for names in the hat, even after the hat is empty! Use CTRL C to stop the program when all of the names have been selected.

ENTER/RUN/OBSERVE

Here's a game where you try to guess what number the computer has selected in the fewest possible guesses. Have fun!

```
 10 HOME
 20 REM *** THIS PICKS A NUMBER BETWEEN 99 AND
 0 ***
 30 N=INT(100*RND(1))
 40 REM *** THIS ASKS YOU TO GUESS WHICH NUMBER
 ***
 50 PRINT " THERE ARE 0 TO 99 JELLY BEANS IN A
 JAR."
 60 PRINT " CAN YOU GUESS HOW MANY ARE RED?"
 70 X=0
 80 INPUT "GUESS!";G
 90 IF G<N THEN PRINT "YOUR GUESS IS TOO LOW."
100 IF G>N THEN PRINT "YOUR GUESS IS TOO HIGH."
110 IF G=N GOTO 200
120 PRINT "MAKE ANOTHER ";
130 X=X+1
140 GOTO 80
```

(program continued)

```
200 PRINT:PRINT:PRINT "VERY GOOD!  YOU REQUIRED
 ";X;" GUESSES!"

210 PRINT "IF YOU WISH TO PLAY AGAIN, TYPE YES
AND PRESS RETURN."

220 INPUT A$

230 IF A$="YES" GOTO 30

240 PRINT "THANKS FOR PLAYING."

250 END
```

List the program and be sure you understand what each part does. RUN it several times.

CHALLENGE

Add more REM statements to the program on the last page as you figure out each part of the program.

When you feel that you understand the program, make these changes:

1. Make the computer select a number between 1 and 150.
2. After seven guesses, have the computer tell you the number it selected.

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INFORMATION

Random responses can be selected.

ENTER/RUN/OBSERVE

```
 1Ø HOME
 2Ø INPUT "WHAT IS YOUR NAME?";N$
 3Ø X=INT(5*RND(1))
 4Ø A$(1)="WHAT A FUNNY NAME!"
 5Ø A$(2)="I LOVE THAT NAME!"
 6Ø A$(3)="I HAVE A COUSIN NAMED "+N$+"!"
 7Ø A$(4)="WITH A NAME LIKE "+N$+" YOU'RE
 BOUND TO BE FAMOUS!"
 8Ø A$(Ø)="IF THAT IS YOUR NAME HOW COME YOU
 SPELLED IT WRONG?"
 9Ø PRINT:PRINT
1ØØ PRINT A$(X)
11Ø FOR T=1 TO 2ØØ:NEXT T
12Ø PRINT:PRINT
13Ø GOTO 2Ø
```

CHALLENGE

Make changes in the name program above.

Notice that A$(3) is really three strings added together. The same is true for A$(4).

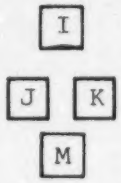
REVIEW: Choose the command or key which will cause the function described below.

COMMAND/KEY	FUNCTION
	Generates a random number between Ø and 1, including Ø.

REFERENCE

COMMAND/KEY	FUNCTION
→	Used to move the cursor to the right when the computer is not in the CURSOR MOVEMENT MODE.
CHR$(X)	Prints characters on the screen, clears the screen, beeps, and performs many other actions, depending upon the number you use with it.
CTRL X	If you want to get out of the editing process with your line the way it was originally, these keys will do it, if you haven't pressed RETURN yet.
ESC	This key puts the computer in the CURSOR MOVEMENT MODE.
FRE(Ø)	Tells how much usable memory is left in the computer.
IF-THEN	Requires the computer to make a decision. It does one thing if the condition is true, and something else if it is not.

REFERENCE (continued)

COMMAND/KEY	FUNCTION
	When the computer is in the CURSOR MOVEMENT MODE, these four keys will move the cursor in the direction indicated: up, down, right, left.
INT(X)	Turns real numbers into integers by eliminating all numerals to the right of the decimal point.
PR#Ø	Turns the printer off.
PR#1	Turns the printer on.
REPT	Holding this key down while pressing another will cause the character to be repeated. You don't have to keep hitting the key.
RND(1)	Generates a random number between Ø and 1, including Ø.
SPACE BAR	Pressing this will get you out of the CURSOR MOVEMENT MODE.

CONGRATULATIONS!!!

You have now finished the yellow instructional level of TLC FOR GROWING MINDS and have a good working vocabulary of BASIC commands you can use to command your microcomputer.

You should now work the YELLOW projects in the TLC Project Book, Volume 3 & 4. They will help you gain experience using the commands you have already learned. When you have finished the YELLOW projects, Volume 4 (Green) of TLC FOR GROWING MINDS will help you learn more commands.

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